USER'S MANUAL

KNIGHT ONLINE SERIES

UPS

3 phase 220V

KO-100003P3(L) / KO-150003P3(L) / KO-200003P3(L)

Uninterruptible Power Supply System

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1. Safety and EMC instructions

Caution: Please comply with all warnings and operating instructions in this manual strictly. Save this manual properly and read carefully the following instructions before installing the unit. Do not operate this unit before reading through all safety information and operating instructions carefully

Please read carefully the following user manual and the safety instructions before installing the unit or using the unit!

1-1. Transportation and Storage

Please transport the UPS system only in the original package to protect against shock and impact.

The UPS must be stored in the room where it is ventilated and dry.

1-2. Preparation

Condensation may occur if the UPS system is moved directly from cold to warm environment. The UPS system must be absolutely dry before being installed. Please allow at least two hours for the UPS system to acclimate the environment.

Do not install the UPS system near water or in moist environments.

Do not install the UPS system where it would be exposed to direct sunlight or nearby heater.

Do not block ventilation holes in the UPS housing.

1-3. Installation

Do not connect appliances or devices which would overload the UPS (e.g. big motor-type equipment)) to the UPS output sockets or terminal.

Place cables in such a way that no one can step on or trip over them.

Do not block air vents in the housing of UPS. The UPS must be installed in a location with good ventilation. Ensure enough space on each side for ventilation.

UPS has provided earthed terminal, in the final installed system configuration, equipotential earth bonding to the external UPS battery cabinets.

The UPS can be installed only by qualified maintenance personnel.

An appropriate disconnect device as short-circuit backup protection should be provided in the building wiring installation.

An integral single emergency switching device which prevents further supply to the load by the UPS in any mode of operation should be provided in the building wiring installation.

Connect the earth before connecting to the building wiring terminal.

Installation and Wiring must be performed in accordance with the local electrical laws and regulations.

1-4. Operation

Do not disconnect the earth conductor cable on the UPS or the building wiring terminals in any time since this would cancel the protective earth of the UPS system and of all connected loads.

The UPS system features its own, internal current source (batteries). The UPS output sockets or output terminal blocks may be electrically live even if the UPS system is not connected to the building wiring outlet.

In order to fully disconnect the UPS system, first press the "OFF" button and then disconnect the mains.

Ensure that no liquid or other foreign objects can enter into the UPS system.

The UPS can be operated by any individuals with no previous experience.

2. Installation and Setup

There are two different types of online UPS: standard and long-time models. Please refer to the following model table.

Model	Type	Model	Type
10K	Standard model	10KL	Long-time model
15K		15KL	
20K		20KL	

We also offer optional parallel function for these two types by request. The UPS with parallel function is called as "Parallel model". We have described detailed installation and operation of Parallel Model in the following chapter.

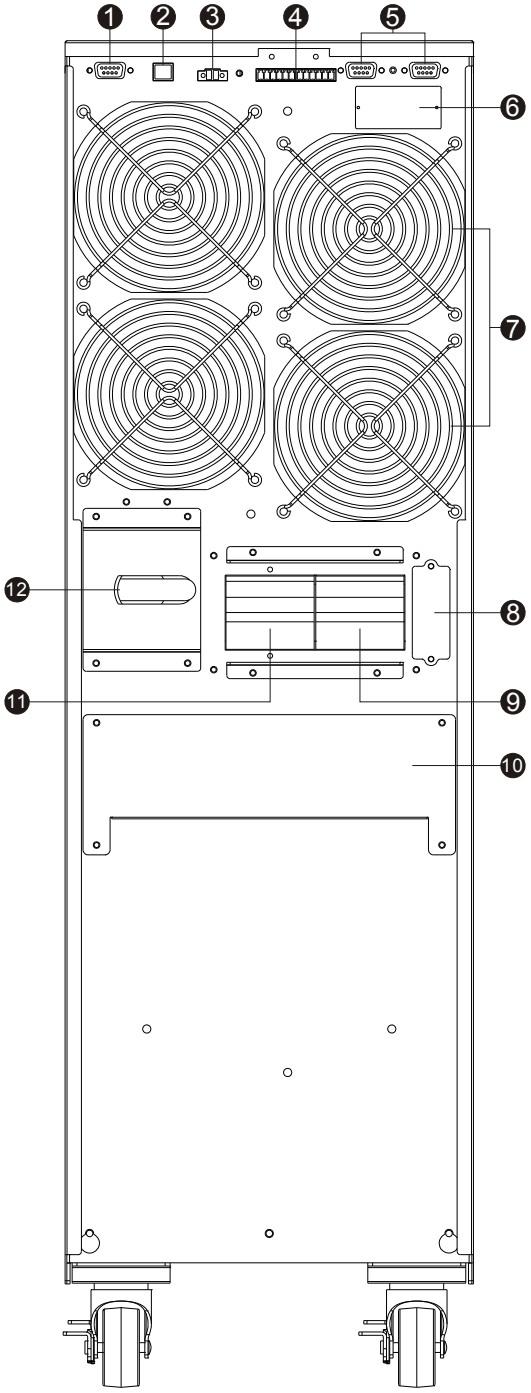
2-1. Unpacking and Inspection

Unpack the package and check the package contents. The shipping package contains:

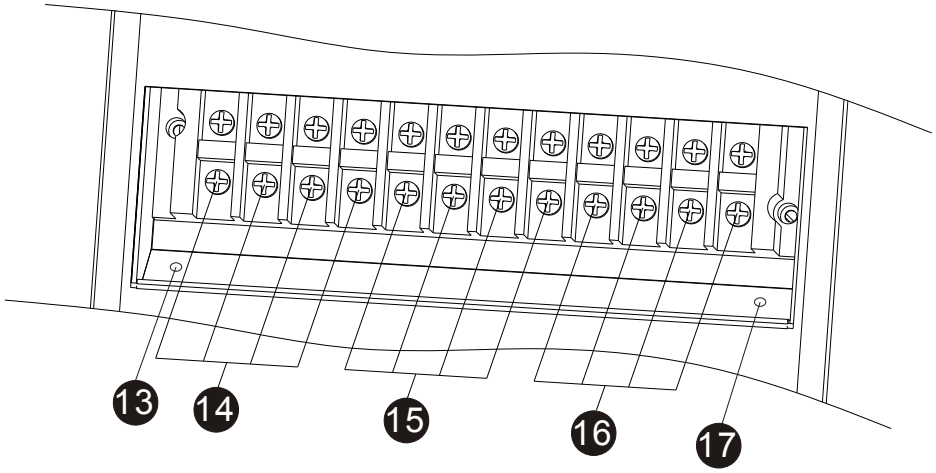
- One UPS
- One user manual
- One monitoring software CD
- One RS-232 cable (option)
- One USB cable
- One parallel cable (only available for parallel model)
- One share current cable (only available for parallel model)

NOTE: Before installation, please inspect the unit. Be sure that nothing inside the package is damaged during transportation. Do not turn on the unit and notify the carrier and dealer immediately if there is any damage or lacking of some parts. Please keep the original package in a safe place for future use.

2-2. Rear Panel View



10K(L)/15K(L)/20K(L) Rear Panel



10K(L)15K(L)/20K(L) Input/Output Terminal

1. RS-232 communication port
2. USB communication port
3. Emergency power off function connector (EPO connector)
4. Share current port (only available for parallel model)
5. Parallel port (only available for parallel model)
6. Intelligent slot
7. Power stage fan
8. External battery terminal(Only available for L model)
9. Bypass Input Circuit Breaker(Only available for dual input unit)
10. Input/Output terminal (Refer to 2)
11. Line Input circuit breaker
12. Maintenance bypass switch
13. Output Grounding terminal
14. Output terminal: connect to mission-critical loads
15. Line input terminal
16. Bypass input terminal (Only available for dual input)
17. Input Grounding terminal

2-3. Single UPS Installation

Installation and wiring must be performed in accordance with the local electric laws/regulations and execute the following instructions by professional personnel.

1) Make sure the mains wire and breakers in the building are enough for the rated capacity of UPS to avoid the hazards of electric shock or fire.

NOTE: Do not use the wall receptacle as the input power source for the UPS, as its rated current is less than the UPS's maximum input current. Otherwise the receptacle may be burned and destroyed.

2) Switch off the mains switch in the building before installation.

3) Turn off all the connected devices before connecting to the UPS.

4) Prepare wires based on the following table:

Model	Wiring spec (AWG)				
	Input(Ph)	Output(Ph)	Neutral	Battery	Ground
10K	10	10	8		8
10KL	10	10	8	8	8
15K	8	8	6		6
15KL	8	8	6	6	6
20K	8	8	6		6
20KL	8	8	6	6	6

NOTE 1: The cable for 10K/10KL should be able to withstand over 40A current. It is recommended to use AWG 10 or thicker wire for Phase and AWG 8 or thicker wire for Neutral for safety and efficiency.

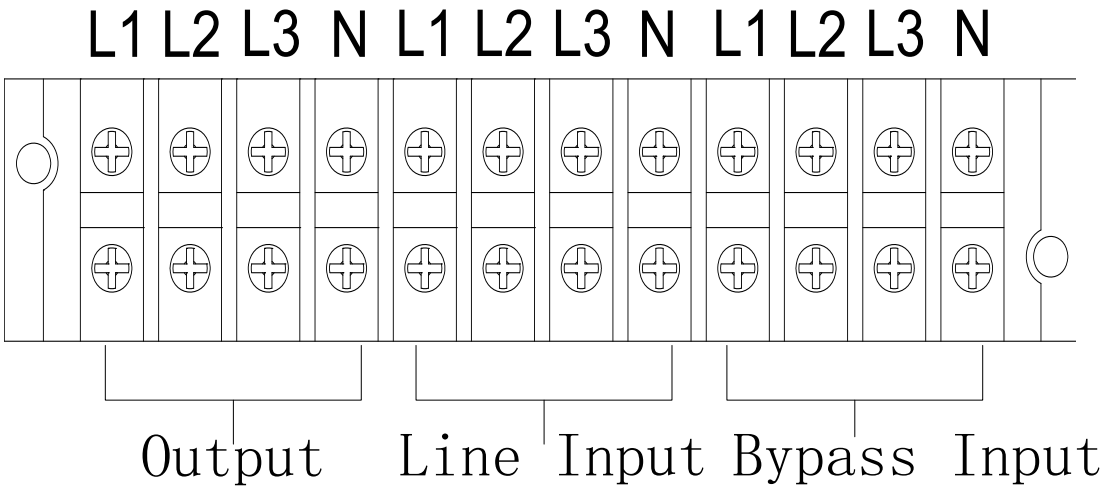
NOTE 2: The cable for 15K/15KL should be able to withstand over 63A current. It is recommended to use AWG 8 or thicker wire for Phase and AWG 6 or thicker wire for Neutral for safety and efficiency.

NOTE 3: The cable for 20K/20KL should be able to withstand over 63A current. It is recommended to

use AWG 8 or thicker wire for Phase and AWG 6 or thicker wire for Neutral for safety and efficiency.

NOTE 4: The selections for color of wires should be followed by the local electrical laws and regulations.

5) Remove the terminal block cover on the rear panel of UPS. Then connect the wires according to the following terminal block diagrams: (Connect the earth wire first when making wire connection. Disconnect the earth wire last when making wire disconnection!)



Terminal Block wiring diagram of 10K(L)/15K(L)/20K(L)

For dual input unit, if there is two separate input, connect the Line input and bypass input respectively; if the is only one common input, please connect the line input and bypass input together.

NOTE 1: Make sure that the wires are connected tightly with the terminals.

NOTE 2: Please install the output breaker between the output terminal and the load, and the breaker should be qualified with leakage current protective function if necessary.

6) Put the terminal block cover back to the rear panel of the UPS.

Warning: (Only for standard model)

- Make sure the UPS is not turned on before installation. The UPS should not be turned on during wiring connection.
- Do not try to modify the standard model to the long-run model. Particularly, do not try to connect the standard internal battery to the external battery. The battery type and voltage may be different. If you connect them together, it maybe causes the hazard of electric shock or fire!

Warning: (Only for L model)

- Make sure a DC breaker or other protection device between UPS and external battery pack is installed. If not, please install it carefully. Switch off the battery breaker before installation.

NOTE: Set the battery pack breaker in "OFF" position and then install the battery pack.

- Pay highly attention to the rated battery voltage marked on the rear panel. If you want to change the numbers of the battery pack, please make sure you modify the setting simultaneously. The connection with wrong battery voltage may cause permanent damage of the UPS. Make sure the voltage of the battery pack is correct.
- Pay highly attention to the polarity marking on external battery terminal block, and make sure the correct battery polarity is connected. Wrong connection may cause permanent damage of the UPS.

- Make sure the protective earth ground wiring is correct. The wire current spec, color, position, connection and conductance reliability should be checked carefully.
- Make sure the utility input & output wiring is correct. The wire current spec, color, position, connection and conductance reliability should be checked carefully. Make sure the L/N site is correct, not reverse and short-circuited.

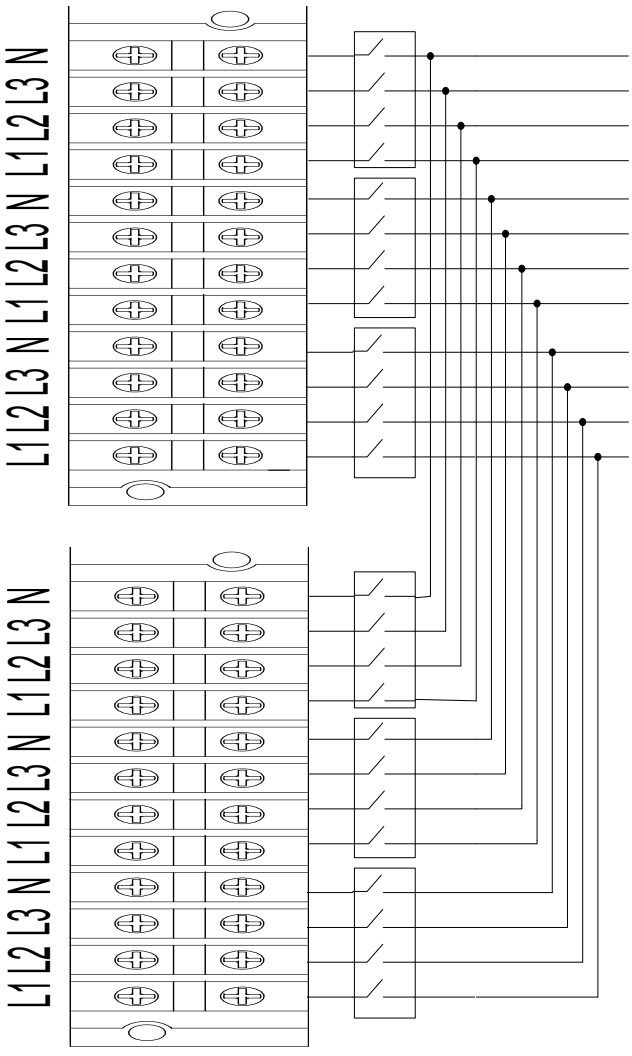
2-4. UPS Installation for Parallel System

If the UPS is only available for single operation, you may skip this section to the next.

1) Install and wires the UPSs according to the section 2-3.
2) Connect the output wires of each UPS to an output breaker.
3) Connect all output breakers to a major output breaker. Then this major output breaker will directly connect to the loads.
4) Each UPS is connected to an independent battery pack.

NOTE: The parallel system can not use one battery pack. Otherwise, it will cause system permanent failure.

5) Refer to the following wiring diagram:



Wiring diagram of parallel system for 10K(L)/15K(L)/20K(L)

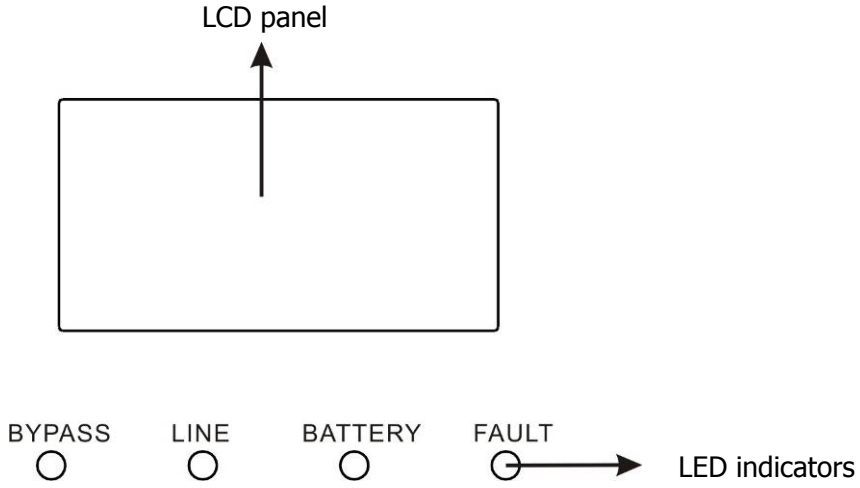
3. Operations

3-1. Button Operation

Button	Function
ON/Enter Button	➢ Turn on the UPS: Press and hold the button more than 0.5s to turn on the UPS. ➢ Enter Key: Press this button to confirm the selection in setting menu.
OFF/ESC Button	➢ Turn off the UPS: Press and hold the button more than 0.5s to turn off the UPS. ➢ Esc key: Press this button to return to last menu in setting menu.
Test/Up Button	➢ Battery test: Press and hold the button more than 2s to test the battery while in AC mode or CVCF* mode. ➢ UP key: Press this button to display next menu or selection.
Mute/Down Button	➢ Mute the alarm: Press and hold the button more than 2s to mute the buzzer. Please refer to section 3-4-9 for details. ➢ Down key: Press this button to display previous menu or selection.
Test/Up + Mute/Down Button	➢ Press and hold the two buttons simultaneous more than 1s to enter/escape the setting menu.

* CVCF means Constant Voltage and Constant Frequency.

3-2. LED Indicators and LCD Panel



LED Indicators:

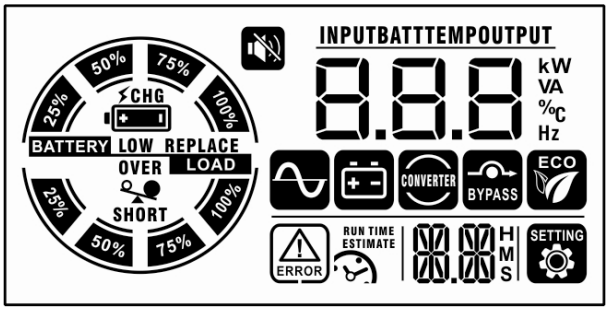
There are 4 LEDs on front panel to show the UPS working status:

Mode / LED	Bypass	Line	Battery	Fault
UPS Startup	●	●	●	●
No Output mode	○	○	○	○
Bypass mode	●	○	○	○
AC mode	○	●	○	○
Battery mode	○	○	●	○
CVCF mode	○	●	○	○
Battery Test	●	●	●	○
ECO mode	●	●	○	○
Fault	○	○	○	●

Note: ● means LED is lighting, and ○ means LED is faded.

*When the UPS is in bypass mode but no bypass output voltage exists, Bypass LED will flicker.

LCD Panel:



Display	Function
Estimated or running time setting and information	
RUN TIME ESTIMATE 88.88 H M S	Battery estimated time or running time in numbers H: hours, M: minutes, S: seconds
Setting operation	
SETTING	Setting operation.
Fault & warning information	
ERROR	Warning or fault situation occurs.
88.88	Warning and fault codes, and the codes are listed in details in "3-9 Fault Code" and "3-11 warning Code" sections.
Mute operation	
	UPS alarm is disabled.
UPS information	
INPUTBATTTEMPOUTPUT 8.8.8 kW VA % °C Hz	Input and output voltage, frequency, battery voltage, load information, and internal temperature. V: input/output voltage/ battery voltage, Hz: frequency, %: load level,°C: temperature, KW: active power, KVA: apparent power, A: output current
Load information	
25% 50% 75% 100%	Load level by 0-25%, 26-50%, 51-75%, and 76-100%.
OVER	Overload.
SHORT	Load or the output is short.
Mode operation information	
	Line mode.
	Battery mode.
BYPASS	Bypass mode.
ECO	ECO mode.
CONVERTER	CVCF mode.
CHG	UPS is charging battery.
Battery information	
25% 50% 75% 100%	Battery capacity by 0-25%, 26-50%, 51-75%, and 76-100%.
LOW	Low battery level and low battery voltage.

3-3. Audible Alarm

Description	Buzzer status	Muted
UPS status		
Bypass mode	Sounding once every 2 minutes	Yes
Battery mode	Sounding once every 4 seconds	
Fault mode	Sounding continuously	
Warning		
Overload	Sounding twice every second	No
Others	Sounding once every second	
Fault		
All	Sounding continuously	Yes

3-4. Single UPS Operation

1. Turn on the UPS with utility power supply (in AC mode)

1) After power supply is connected correctly, set the breaker of the battery pack at "ON" position (the step only available for long-run model). Then set the line input breaker at "ON" position(for dual input unit, also set the bypass input breaker at "ON"). At this time the fan is running and the UPS enter to power on mode for initialization, several seconds later, UPS operates in Bypass mode and supplies power to the loads via the bypass.

   NOTE: When UPS is in Bypass mode, the output voltage will directly power from utility after you switch on the input breaker. In Bypass mode, the load is not protected by UPS. To protect your precious devices, you should turn on the UPS. Refer to next step.

2) Press and hold the "ON" button for 0.5s to turn on the UPS and the buzzer will beep once.

3) A few seconds later, the UPS will enter to AC mode. If the utility power is abnormal, the UPS will operate in Battery mode without interruption.

   NOTE: When the UPS is running out battery, it will shut down automatically at Battery mode. When the utility power is restored, the UPS will auto restart in AC mode.

2. Turn on the UPS without utility power supply (in Battery mode)

1) Make sure that the breaker of the battery pack is at "ON" position (only for long-run model).

2) Press the "ON" button to set up the power supply for the UPS, UPS will enter to power on mode. After initialization UPS will enter to No Output mode, then Press and hold the "ON" button for 0.5s to turn on the UPS, and the buzzer will beep once.

3) A few seconds later, the UPS will be turned on and enter to Battery mode.

3. Connect devices to UPS

After the UPS is turned on, you can connect devices to the UPS.

1) Turn on the UPS first and then switch on the devices one by one, the LCD panel will display total load level.

2) If it is necessary to connect the inductive loads such as a printer, the in-rush current should be calculated carefully to see if it meets the capacity of the UPS, because the power consumption of this kind of loads is too big.

3) If the UPS is overload, the buzzer will beep twice every second.

4) When the UPS is overload, please remove some loads immediately. It is recommended to have the total loads connected to the UPS less than 80% of its nominal power capacity to prevent overload for system safety.

5) If the overload time is over acceptable time listed in spec at AC mode, the UPS will automatically transfer to Bypass mode. After the overload is removed, it will return to AC mode. If the overload time is over acceptable time listed in spec at Battery mode, the UPS will become fault status. At this time, if bypass is enabled, the UPS will power to the load via bypass. If bypass function is disabled

or the input power is not within bypass acceptable range, it will cut off output directly.

4. Charge the batteries

1) After the UPS is connected to the utility power, the charger will charge the batteries automatically except in Battery mode or during battery self-test.
2) Suggest to charge batteries at least 10 hours before use. Otherwise, the backup time may be shorter than expected time.
3) Make sure the battery numbers setting on the control board (Please refer to the section 3-4-12 for detailed setting) is consistent to real connection.

5. Battery mode operation

1) When the UPS is in Battery mode, the buzzer will beep according to different battery capacity. If the battery capacity is more than 25%, the buzzer will beep once every 4 seconds; If the battery voltage drops to the alarm level, the buzzer will beep quickly (once every sec) to remind users that the battery is at low level and the UPS will shut down automatically soon. Users could switch off some non-critical loads to disable the shutdown alarm and prolong the backup time. If there is no more load to be switched off at that time, you have to shut down all loads as soon as possible to protect the devices or save data. Otherwise, there is a risk of data loss or load failure.
2) In Battery mode, if buzzer sound annoys, users can press the Mute button to disable the buzzer.
3) The backup time of the long-run model depends on the external battery capacity.
4) The backup time may vary from different environment temperature and load type.
5) When setting backup time for 16.5 hours (default value from LCD panel), after discharging 16.5 hours, UPS will shut down automatically to protect the battery. This battery discharge protection can be enabled or disabled through LCD panel control. (Refer to 3-7-2 LCD setting section)

6. Test the batteries

1) If you need to check the battery status when the UPS is running in AC mode/CVCF mode, you could press the "Test" button to let the UPS do battery self-test.
2) Users also can set battery self-test through monitoring software.

7. Turn off the UPS with utility power supply in AC mode

1) Turn off the inverter of the UPS by pressing "OFF" button for at least 0.5s, and then the buzzer will beep once. The UPS will turn into Bypass mode.

   NOTE 1: If the UPS has been set to enable the bypass output, it will bypass voltage from utility power to output terminal even though you have turned off the UPS (inverter).

   NOTE 2: After turning off the UPS, please be aware that the UPS is working at Bypass mode and there is risk of power loss for connected devices.
2) In Bypass mode, output voltage of the UPS is still present. In order to cut off the output, switch off the line input breaker (for dual input unit, also switch off the bypass line breaker). A few seconds later, there is no display shown on the display panel and UPS is complete off.

8. Turn off the UPS without utility power supply in Battery mode

1) Turn off the UPS by pressing "OFF" button for at least 0.5s, and then the buzzer will beep once.
2) Then UPS will cut off power to output and there is no display shown on the display panel.

9. Mute the buzzer

1) To mute the buzzer, please press the "Mute" button for at least 0.5s. If you press it again after the buzzer is muted, the buzzer will beep again.
2) Some warning alarms can't be muted unless the error is fixed. Please refer to section 3-3 for the details.

10. Operation in warning status

1) When Fault LED flashes and the buzzer beeps once every second, it means that there are some problems for UPS operation. Users can get the warning indicator from LCD panel. Please check the trouble shooting table in chapter 4 for details.

2) Some warning alarms can't be muted unless the error is fixed. Please refer to section 3-3 for the details.

11. Operation in Fault mode

1) When Fault LED illuminates and the buzzer beeps continuously, it means that there is a fatal error in the UPS. Users can get the fault code from display panel. Please check the trouble shooting table in chapter 4 for details.
2) Please check the loads, wiring, ventilation, utility, battery and so on after the fault occurs. Don't try to turn on the UPS again before solving the problems. If the problems can't be fixed, please contact the distributor or service people immediately.
3) For emergency case, please cut off the connection from utility, external battery, and output immediately to avoid more risk or danger.

12. Operation of changing battery numbers

1) This operation is only available for professional or qualified technicians.
2) Turn off the UPS. If the load couldn't be cut off, you should remove the cover of maintenance bypass switch on the rear panel and turn the maintenance switch to "BPS" position first.
3) Switch off the line input breaker(for dual input unit, also switch off the bypass input breaker), and switch off the battery breaker (only available for long-run model).
4) Remove the cabinet cover, and disconnect battery wire for standard model. Then modify the jumper of JS3 on the control board to set the battery numbers as following table.

Battery Number in series	JS3			
	pin1 & pin2	pin3 & pin4	Pin5 & pin6	pin7 & pin8
18	1	0	0	X
19	0	1	0	X
20	0	0	1	X

Note:1 = connect with jumper; 0 = no jumper; x = the pins are for other functions.

5) Modify the battery pack for the setting number carefully. After complete it, put the cover back, switch on the battery breaker for long-run model.
6) Switch on the line input breaker(for dual input unit, also switch on the bypass input breaker) and the UPS will enter Bypass mode. If the UPS is in maintenance Bypass mode, turn the maintenance switch to "UPS" position and then turn on the UPS.

3-5. Parallel Operation

1. Parallel system initial startup

First of all, please make sure all of the UPSs are parallel models and have the same configuration.

1) Turn on each UPS to AC mode respectively (Refer to section 3-4(1)). Then, measure the inverter output voltage of each phase for each UPS to check if the inverter voltage difference between actual output and setting value is less than 1.5V (typical 1V) with multimeter. If the difference is more than 1.5V, please calibrate the voltage by configuring inverter voltage adjustment (Refer to Program 19, 20 and 21, section 3-7-2) in LCD setting. If voltage difference remains more than 1.5V after calibration, please contact your local distributor or service center for help.
2) Calibrate the output voltage measurement by configuring output voltage calibration (Refer to Program 22, 23, and 24, section 3-7-2) in LCD setting to make sure the difference between real output voltage and detected value of UPS is less than 1V.
3) Turn off each UPS (Refer to section 3-4(7.)). Then, follow the wiring procedure in section 2-4.
4) Remove the cover of parallel share current cable port on the UPS, connect each UPS one by one with the parallel cable and share current cable, and then screw the cover back.
5) **Turn on the parallel system in AC mode:**
   a) Turn on the line input breaker of each UPS(for dual input, also turn on bypass input breaker). After all UPSs enter to bypass mode, measure the output voltage between two UPS for the

same phase to make sure the phase sequence is correct . If these two voltage differences are near to zero, that means all connections are correct. Otherwise, please check if the wirings are connected correctly.

b) Turn on the output breaker of each UPS.

c) Turn on each UPS in turns. After a while, the UPSs will enter to AC mode synchronously and then, the parallel system is completed.

6) **Turn on the parallel system in Battery mode:**

a) Turn on the battery breaker (only available in long-run model) and output breaker of each UPS.

NOTE: It's not allowed to share one battery pack for long-run UPSs in parallel system. Each UPS should be connected to its battery pack.

b) Turn on any UPS. A few seconds later, the UPS will enter to battery mode.

c) Then, turn on another UPS. A few seconds later, the UPS will enter to battery mode and add to the parallel system.

d) If you have the third UPS, follow the same procedure of c). Then, the parallel system is complete.

If more detailed information is needed, please contact supplier or service center for parallel operation instruction.

2. Add one new unit into the parallel system

1) You can not add one new unit into the parallel system when whole system is running. You must cut off the load and shutdown the system.

2) Make sure all of the UPS are the parallel models, and follow the wiring refer to section 2-4.

3) Install the new parallel system refers to the previous section.

3. Remove one unit from the parallel system

There are two methods to remove one unit from the parallel system:

First method:

1) Press the "OFF" key twice and each time should be lasted for more than 0.5s. Then, the UPS will enter into bypass mode or no output mode without output.

2) Turn off the output breaker of this unit, and then turn off the input breaker of this unit.

3) After it shuts down, you can turn off the battery breaker (for long-run model) and remove the parallel and share current cables. And then remove the unit from the parallel system.

Second method:

1) If the bypass is abnormal, you can not remove the UPS without interruption. You must cut off the load and shut down the system first.

2) Make sure the bypass setting is enabled in each UPS and then turn off the running system. All UPSs will transfer to Bypass mode. Remove all the maintenance bypass covers and set the maintenance switches from "UPS" to "BPS". Turn off all the input breakers and battery breakers in parallel system.

3) Turn off the output breaker and remove the parallel cable and share current cable of the UPS which you want to remove. Then, remove it from parallel system.

4) Turn on the input breaker of the remaining UPS and the system will transfer to Bypass mode. Set the maintenance switches from "BPS" to "UPS and put the maintenance bypass covers back.

5) Turn on the remaining UPS according to the previous section.

Warning: (Only for the parallel system)

- Before turning on the parallel system to activate inverter, make sure that all unit's maintenance switch at the same position.
- When parallel system is turned on to work through inverter, please do not operate the maintenance switch of any unit.

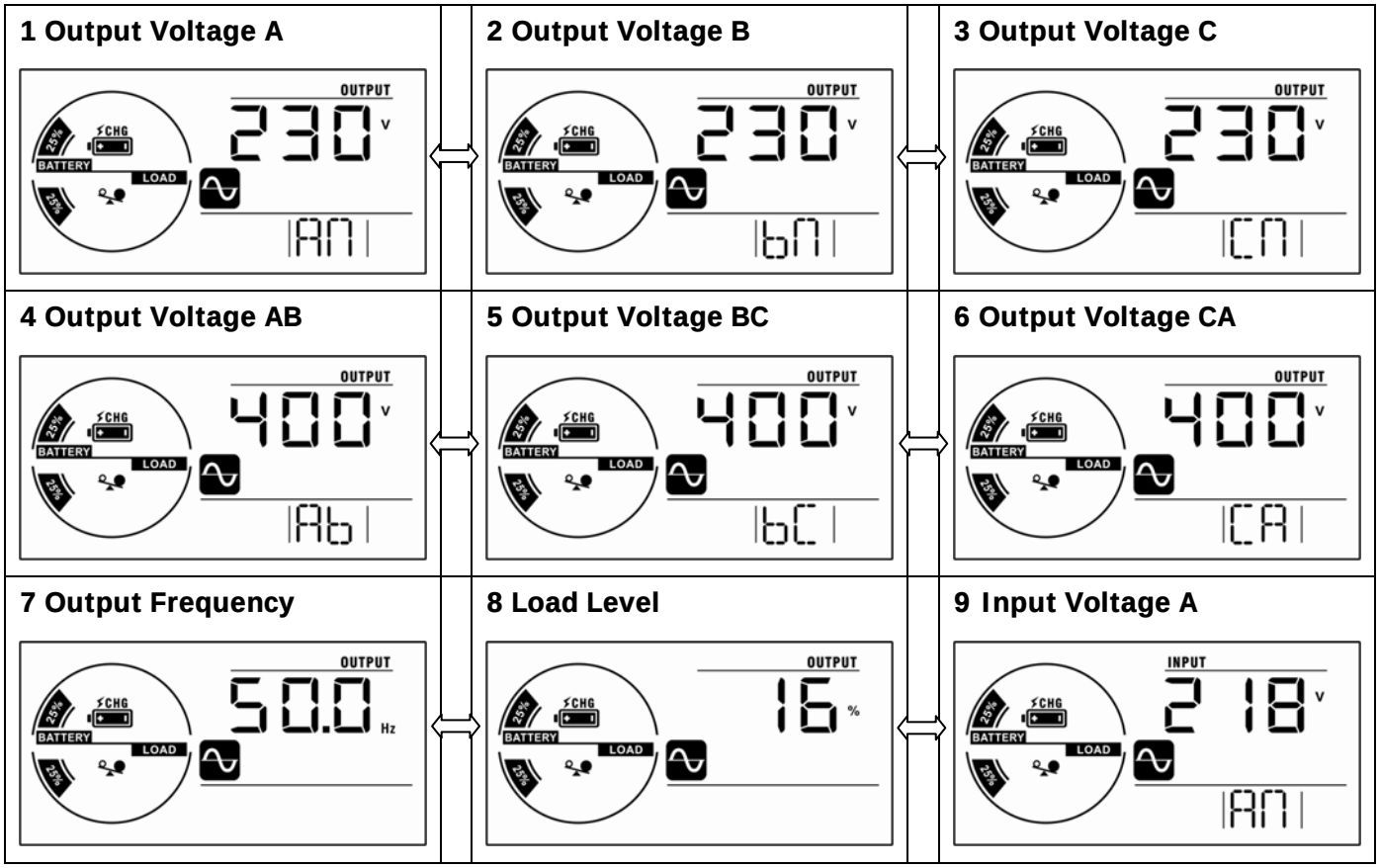
3-6. LCD Display Wording Index

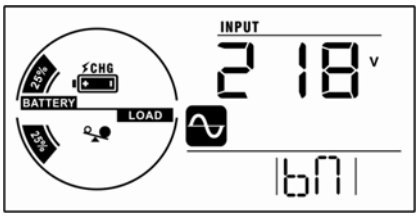
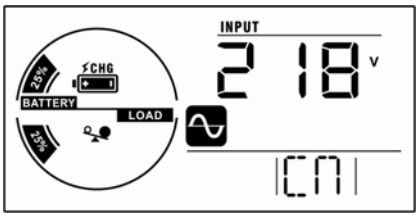
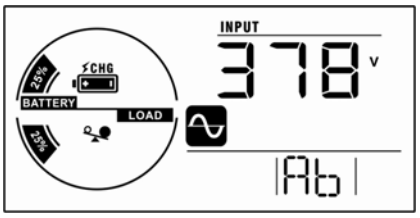
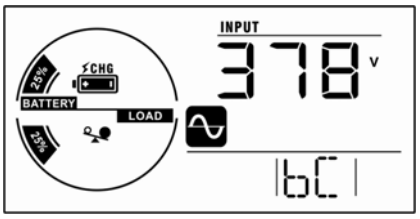
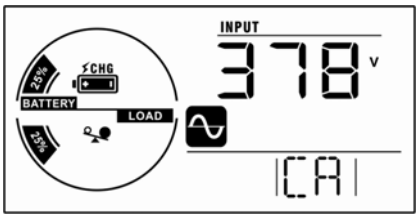
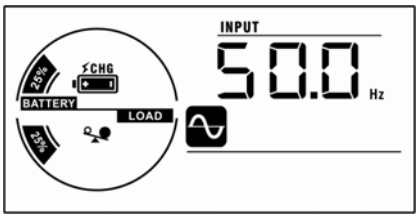
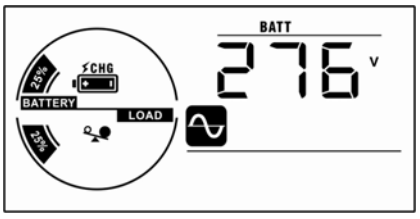
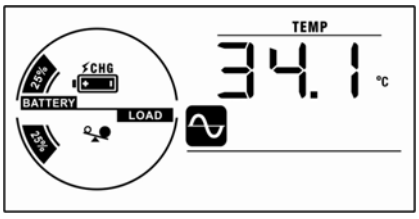
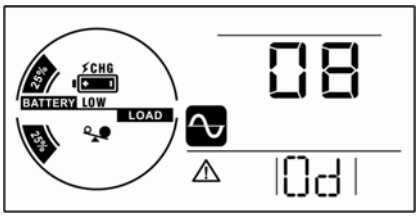
Abbreviation	Display content	Meaning
ENA	ENA	Enable
DIS	dIS	Disable
ATO	AtO	Auto
FBD	Fbd	Not allowed
OPN	OPN	Allow
CHE	CHE	Check
OP.1	OP.1	Inverter A voltage
OP.2	OP.2	Inverter B voltage
OP.3	OP.3	Inverter C voltage
AN	AN	The first phase
BN	bN	The second phase
CN	CN	The third phase
AB	Ab	The first line
BC	bC	The second line
CA	CA	The third line

3-7. LCD Display

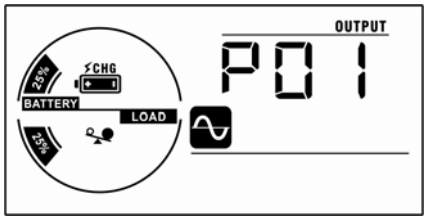
3-7-1. LCD Main Interface

A. Single model: Press up or down key to select the displayed information.



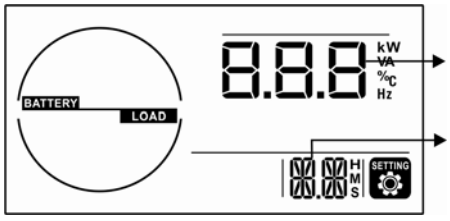
10 Input Voltage B 	**11 Input Voltage C** 	**12 Input Voltage AB** 
13 Input Voltage BC 	**14 Input Voltage CA** 	**15 Input Frequency** 
16 Battery Voltage 	**17 Maximum Temperature** 	**18 Warning Information** 

B. Parallel model: Compared to single model, parallel model will have one more screen to display parallel information of UPS unit.

Parallel information	**"P01": Master UPS** **"P02": Slave1 UPS** **"P03": Slave2 UPS**
	

3-7-2. LCD Setting

At the main interface, press and hold the 'up' and 'down' buttons simultaneous for more than 1 second to enter/escape the setting menu.



There are two parameters to set up the UPS.

Parameter 1: It's for program alternatives. Refer to below table for the details.

Parameter 2: Setting options or values for each program.

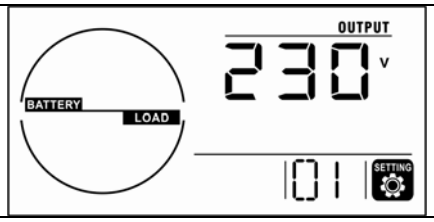
Available programs list for parameter 1:

Code	Description	Bypass / No Output mode	AC mode	ECO mode	CVCF mode	Battery mode	Battery Test
01	Output voltage	Y*					
02	CVCF mode enable/disable	Y					

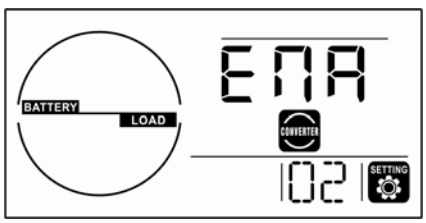
03	Output frequency	Y					
04	Acceptable low voltage for bypass	Y					
05	Acceptable high voltage for bypass	Y					
06	Acceptable low frequency for bypass	Y					
07	Acceptable high frequency for bypass	Y					
08	ECO mode enable/disable	Y					
09	Acceptable low voltage for ECO mode	Y					
10	Acceptable high voltage for ECO mode	Y					
11	Acceptable low frequency for ECO mode	Y					
12	Acceptable high frequency for ECO mode	Y					
13	Bypass mode allowed/forbidden	Y	Y				
14	Manual bypass enable/disable	Y	Y				
15	Maximum battery discharge time setting	Y	Y	Y	Y	Y	Y
16	Neutral loss detection	Y	Y	Y	Y	Y	Y
17	Battery voltage calibration	Y	Y	Y	Y	Y	Y
18	Charger voltage adjustment	Y	Y	Y	Y	Y	Y
19	Inverter A voltage adjustment		Y		Y	Y	
20	Inverter B voltage adjustment		Y		Y	Y	
21	Inverter C voltage adjustment		Y		Y	Y	
22	Output A voltage calibration		Y		Y	Y	
23	Output B voltage calibration		Y		Y	Y	
24	Output C voltage calibration		Y		Y	Y	

*Y means that this program can be set in this mode.
Note: All parameter settings will be saved only when UPS shuts down normally with internal or external battery connection. (Normal UPS shutdown means turning off input breaker in bypass/no output mode).

- **01: Output voltage**

Interface	Setting
	**Parameter 2: Output voltage** You may choose the following output voltage in parameter 2: **208:** Presents output voltage is 208Vac **220:** Presents output voltage is 220Vac **230:** Presents output voltage is 230Vac **240:** Presents output voltage is 240Vac

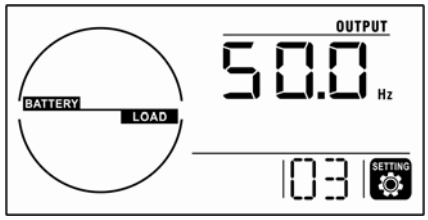
- **02: CVCF mode enable/disable**

Interface	Setting
	**Parameter 2: Frequency mode** Setting output frequency at CVCF mode or not CVCF mode. You may choose following two options in parameter 2: **ENA:** Setting UPS to CVCF mode. If selected, the output frequency will be fixed at 50Hz or 60Hz according to "**Output frequency setting**". The input frequency could be from 46Hz to 64Hz. **DIS:** Setting UPS to normal mode (not CVCF mode). If selected, the output frequency will synchronize with the input frequency within 46~54 Hz at 50Hz or within 56~64 Hz at 60Hz according to setting in **"Output frequency setting"**. If 50 Hz is selected in **"Output frequency setting"**, UPS will transfer to battery mode when input frequency is not within 46~54 Hz. If 60 Hz is selected in **"Output frequency setting"**, UPS will transfer to battery

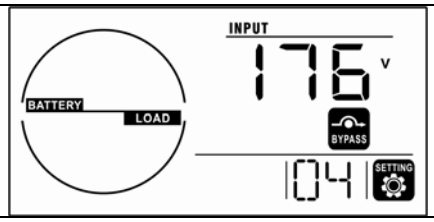
	mode when input frequency is not within 56~64 Hz.

Note: For single unit, it will have bypass output for a couple of seconds after the unit is powered on. Therefore, to avoid damage on connected devices, it's strongly suggested to add an additional Output relay board for CVCF application.

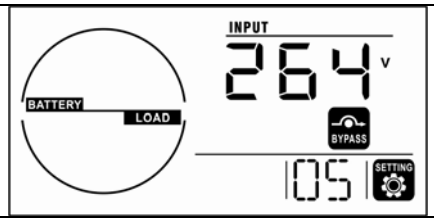
- **03: Output frequency setting**

Interface	Setting
	**Parameter 2: Output Frequency** **50.0Hz:** The output frequency is setting for 50.0Hz. **60.0Hz:** The output frequency is setting for 60.0Hz. **ATO:** If selected, output frequency will be changed based on the latest input utility frequency. If it is within 46Hz and 54Hz, the output frequency will be 50.0Hz. If it is within 56Hz and 64Hz, the output frequency will be 60.0Hz. ATO is default setting. If CVCF mode is enabled and output frequency is set to ATO mode, it will display "A50" when UPS is working on 50Hz mode or "A60" when UPS is working on 60Hz mode in LCD.

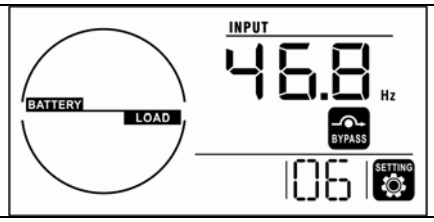
- **04: Acceptable low voltage for bypass**

Interface	Setting
	**Parameter 2:** Set the acceptable low voltage for bypass. Setting range is from 110V to 209V and the default value is 110V.

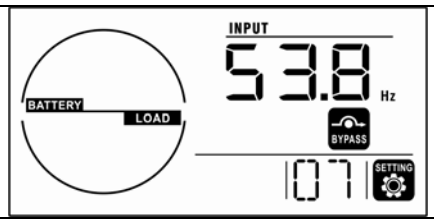
- **05: Acceptable high voltage for bypass**

Interface	Setting
	**Parameter 2:** Set the acceptable high voltage for bypass. Setting range is from 231V to 276V and the default value is 264V.

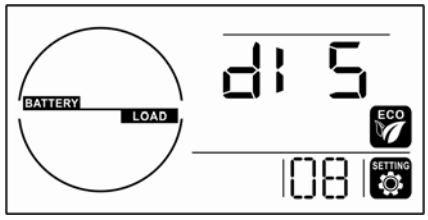
- **06: Acceptable low frequency for bypass**

Interface	Setting
	**Parameter 2:** Set the acceptable low frequency for bypass. 50 Hz system: Setting range is from 46.0Hz to 49.0Hz. 60 Hz system: Setting range is from 56.0Hz to 59.0Hz. The default value is 46.0Hz/56.0Hz.

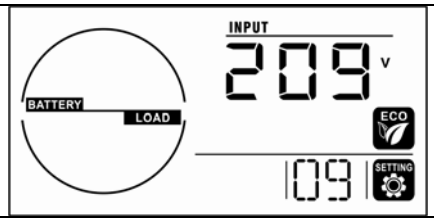
- **07: Acceptable high frequency for bypass**

Interface	Setting
	**Parameter 2:** Set the acceptable high frequency for bypass. 50 Hz: Setting range is from 51.0Hz to 54.0 Hz. 60 Hz: Setting range is from 61.0Hz to 64.0Hz. The default value is 54.0Hz/64.0Hz.

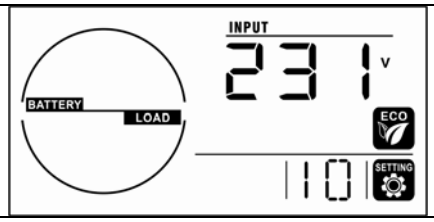
- **08: ECO mode enable/disable**

Interface	Setting
	**Parameter 2:** Enable or disable ECO function. You may choose following two options: **ENA:** enable ECO function; **DIS:**: disable ECO function; If ECO function is disabled, voltage range and frequency range for ECO mode still can be set, but it is meaningless unless the ECO function is enabled.

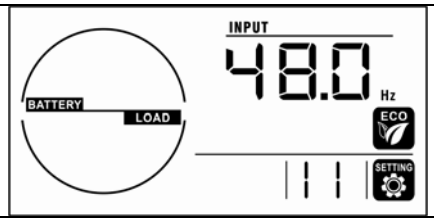
- **09: Acceptable low voltage for ECO mode**

Interface	Setting
	**Parameter 2:** Low voltage point in ECO mode. The setting range is from -5% to -10% of the nominal voltage.

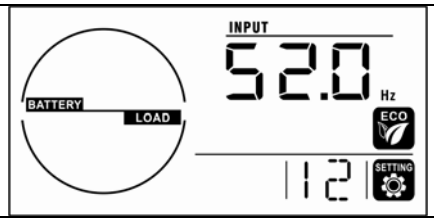
- **10: Acceptable high voltage for ECO mode**

Interface	Setting
	**Parameter 2:** High voltage point in ECO mode. The setting range is from 5% to 10% of the nominal voltage.

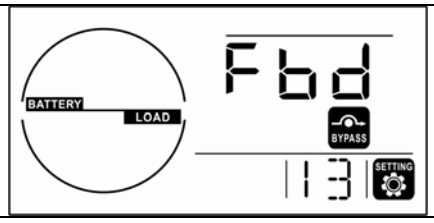
- **11: Acceptable low frequency for ECO mode**

Interface	Setting
	**Parameter 2:** Set low frequency point for ECO mode. 50 Hz system: Setting range is from 46.0Hz to 48.0Hz. 60 Hz system: Setting range is from 56.0Hz to 58.0Hz. The default value is 48.0Hz/58.0Hz.

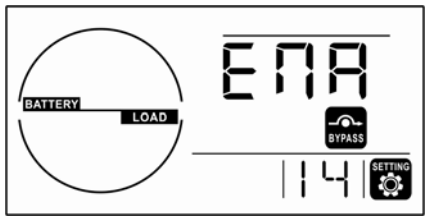
- **12: Acceptable high frequency for ECO mode**

Interface	Setting
	**Parameter 2:** Set high frequency point for ECO mode. 50 Hz: Setting range is from 52.0Hz to 54.0 Hz. 60 Hz: Setting range is from 62.0Hz to 64.0Hz. The default value is 52.0Hz/62.0Hz.

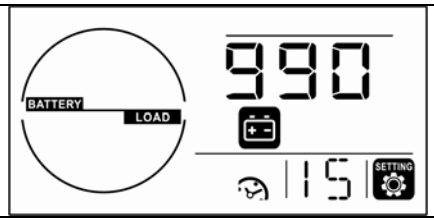
- **13: Bypass mode forbidden/allowed**

Interface	Setting
	**Parameter 2:** Allow or forbidden bypass mode **FBD:** Bypass not allowed. When selected, it's not allowed for running in Bypass mode under any situations. **OPN:** Bypass allowed. When selected, UPS will run at Bypass mode depending on the setting of "**Manual bypass enable/disable**".

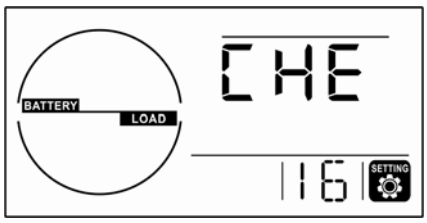
- **14: Manual bypass enable/disable**

Interface	Setting
	**Parameter 2:** **ENA**: Bypass enabled. When selected, bypass mode is activated. **DIS:** Manual bypass disabled. When selected, automatic bypass is acceptable, but manual bypass* is not allowed. *Manual bypass means users manually operate UPS in Bypass mode. For example, pressing OFF button in AC mode to turn into Bypass mode.

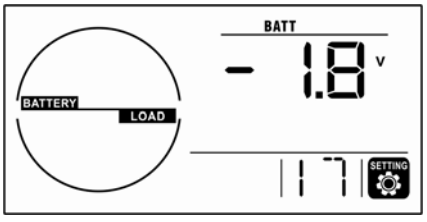
- **15: Maximum battery discharge time setting**

Interface	Setting
	**Parameter 2:** **001~999:** Set the maximum backup time from 1 min to 999 min. UPS will shut down to protect battery after backup time arrives. The default value is 990. **DIS:** Disable battery discharge protection and backup time will depend on battery capacity.

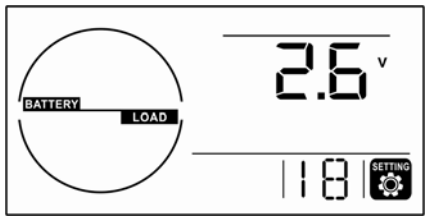
- **16: Neutral loss detection**

Interface	Setting
	**Parameter 2:** **DIS:** Disable the neutral loss detection function. The UPS will not detect the neutral loss or not. **ATO:** The UPS will automatically detect the neutral is lost or not. If neutral loss is detected, an alarm will be generated. If the UPS is turned on, it will transfer to battery mode. When neutral is restored and detected, the alarm will be muted automatically and the UPS will go back to normal mode automatically. **CHE:** The UPS will automatically detect the neutral loss. If neutral loss is detected, an alarm will be generated. If the UPS is turned on, it will transfer to battery mode. When neutral is restored, the alarm will NOT be muted automatically and the UPS will NOT go back to normal mode automatically. Here, you must mute the alarm and make the UPS go back to normal mode manually. The operation is: Firstly, enter this menu and press the "Enter" key to make the "CHE" flash. Secondly, press the "Enter" key again to activate the neutral detection (check). If neutral is detected, the alarm will be muted and the UPS will go back to normal mode. If neutral is not detected, the UPS will continue alarming and stay on the latest status until the neutral is detected well at next manual checking operation. CHE is default setting.

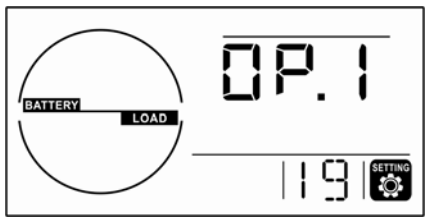
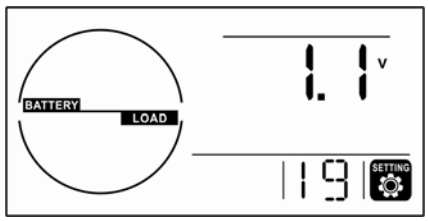
- **17: Battery voltage calibration**

Interface	Setting
	**Parameter 2:** The voltage range is from -9.9V to 9.9V, the default value is 0V.

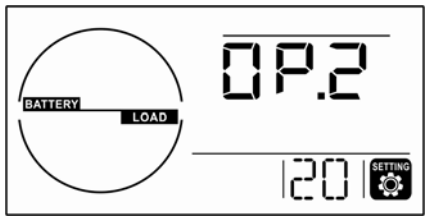
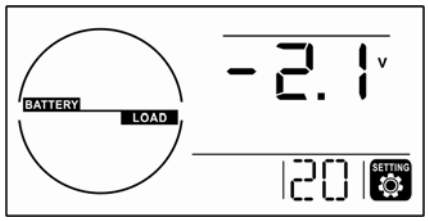
- **18: Charger voltage adjustment**

Interface	Setting
	**Parameter 2:** The voltage range is from -9.9V to 9.9V, the default value is 0V. **NOTE:** *Before making voltage adjustment, be sure to disconnect all batteries first to get the accurate charger voltage. * We strongly suggest using the default value (0). Any modification should be suitable to battery specifications.

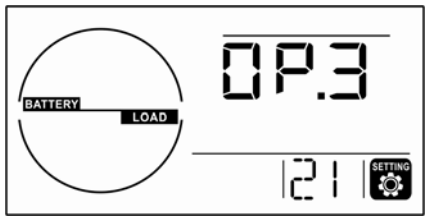
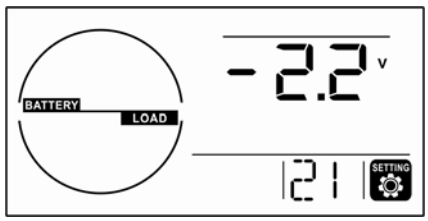
- **19: Inverter A voltage adjustment**

Interface	Setting
(a)  (b) 	**Parameter 2:** After entering this setting menu, it will display OP.1 to represent Inverter A. After pressing "Enter" key, it will be able to adjust the voltage. Refer to graphic (b). The adjustable voltage range is from -9.9V to 9.9V, the default value is 0V.

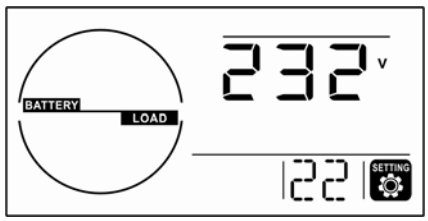
- **20: Inverter B voltage adjustment**

Interface	Setting
(a)  (b) 	**Parameter 2:** After entering this setting menu, it will display OP.2 to represent Inverter B. After pressing "Enter" key, it will be able to adjust the voltage. Refer to graphic (b). The adjustable voltage range is from -9.9V to 9.9V, the default value is 0V.

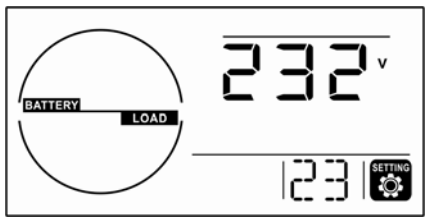
- **21: Inverter C voltage adjustment**

Interface	Setting
(a)  (b)  	**Parameter 2:** After entering this setting menu, it will display OP.3 to represent Inverter C. After pressing "Enter" key, it will be able to adjust the voltage. Refer to graphic (b). The adjustable voltage range is from -9.9V to 9.9V, the default value is 0V.

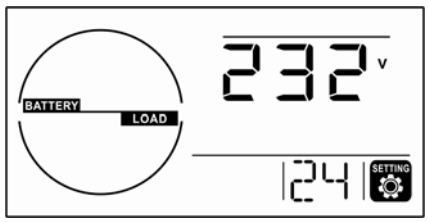
- **22: Output A voltage calibration**

Interface	Setting
 	**Parameter 2:** It shows the internal measurement value of the output A voltage, and you can calibrate it by pressing **Up** or **Down** according to the measurement from an external voltage meter. The calibration result will be effective by pressing **Enter**. The calibration range is limited within +/-9V. This function is normally used for parallel operation.

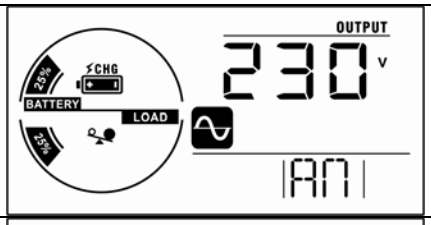
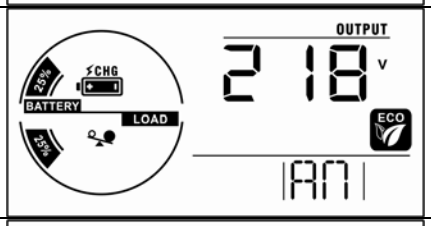
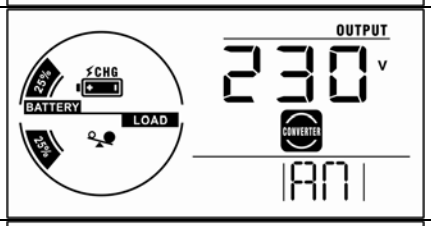
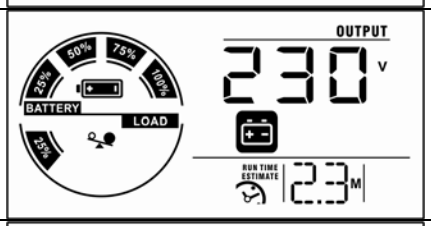
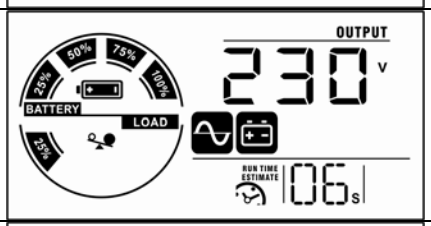
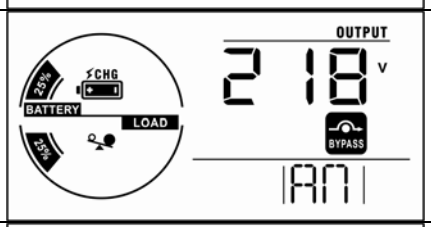
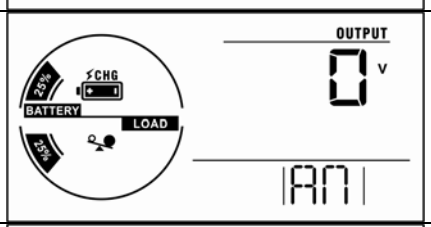
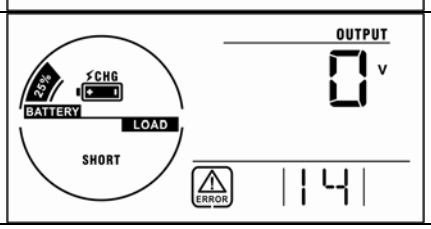
- **23: Output B voltage calibration**

Interface	Setting
 	**Parameter 2:** It shows the internal measurement value of the output B voltage, and you can calibrate it by pressing **Up** or **Down** according to the measurement from an external voltage meter. The calibration result will be effective by pressing **Enter**. The calibration range is limited within +/-9V. This function is normally used for parallel operation.

- **24: Output C voltage calibration**

Interface	Setting
 	**Parameter 2:** It shows the internal measurement value of the output C voltage, and you can calibrate it by pressing **Up** or **Down** according to the measurement from an external voltage meter. The calibration result will be effective by pressing **Enter**. The calibration range is limited within +/-9V. This function is normally used for parallel operation.

3-8. Operating Mode/Status Description

Operating mode/status	Description	LCD display
AC mode	When the input voltage is within acceptable range, UPS will provide pure and stable AC power to output. The UPS will also charge the battery at AC mode.	
ECO mode	When the input voltage is within voltage regulation range and ECO mode is enabled, UPS will bypass voltage to output for energy saving.	
CVCF mode	When input frequency is between 46Hz and 64Hz, the UPS can be set at a constant output frequency, 50 Hz or 60 Hz. The UPS will still charge battery under this mode.	
Battery mode	When the input voltage is beyond the acceptable range or power failure, UPS will backup power from battery and alarm will beep every 4 seconds.	
Battery Test	When UPS is in AC mode or CVCF mode, press "Test" key for more than 2 seconds. Then, UPS will beep once and start "Battery Test". This operation is used to check the battery status.	
Bypass mode	When input voltage is within acceptable range and bypass is enabled, turn off the UPS and it will enter Bypass mode. Alarm beeps every two minutes.	
No output mode	When bypass is out of acceptable range or bypass is disabled (or forbidden), UPS will enter into no-output mode if powering on or turning off the UPS. It means the UPS has no output. Alarm beeps every two minutes.	
Fault status	When fault occurs in UPS, it will display fault icon and fault code in LCD panel. Alarm beeps continuously.	

3-9. Fault Reference Code

Fault code	Fault event	Icon	Fault code	Fault event	Icon
01	Bus start failure	None	1A	Inverter A negative power fault	None
02	Bus over	None	1B	Inverter B negative power fault	None
03	Bus under	None	1C	Inverter C negative power fault	None
04	Bus unbalance	None	21	Battery SCR short circuited	None
06	Converter over current	None	24	Inverter relay short circuited	None
11	Inverter soft start failure	None	29	Battery fuse broken in Battery mode	None
12	High inverter voltage	None	31	Parallel communication failure	None
13	Low inverter voltage	None	36	Parallel output current unbalance	None
14	Inverter A output(line to neutral) short circuited	SHORT	41	Over temperature	None
15	Inverter B output(line to neutral) short circuited	SHORT	42	DSP communication failure	None
16	Inverter C output(line to neutral) short circuited	SHORT	43	Overload	OVER
17	Inverter A-B output (line to line) short circuited	SHORT	46	Incorrect UPS setting	None
18	Inverter B-C output (line to line) short circuited	SHORT	47	MCU communication failure	None
19	Inverter C-A output (line to line) short circuited	SHORT	48	DSP firmware versions are incompatible	None

3-10.Warning Indicator

Warning Description	code	Icon (flashing)	Alarm
Battery is not connected	01		Sounding every second
Over charge	07		Sounding every second
Low battery	08		Sounding every second
Overload	09		Sounding twice every second
Charger failure	0E		Sounding every second
Other warnings	Any warning codes display on warning information page. Please refer to section 3-11 for the details.		Sounding every second

3-11.Warning Code

Warning code	Warning event	Warning code	Warning event
01	Battery unconnected	10	L1 IP fuse broken*
02	IP Neutral loss	11	L2 IP fuse broken*
04	IP phase abnormal	12	L3 IP fuse broken*
05	Bypass phase abnormal	21	Line situations are different in parallel system
07	Over charge	22	Bypass situations are different in parallel system
08	Low battery	33	Locked in bypass after overload 3 times in 30 minutes
09	Overload	34	Converter current unbalance
0A	Fan failure	35	Battery fuse broken
0B	EPO enable	3A	Cover of maintain switch is open
0D	Over temperature	3C	Utility extremely unbalanced
0E	Charger failure	3D	Bypass unstable

*** These alarms are only for the single input unit.**

4. Trouble Shooting

If the UPS system does not operate correctly, please solve the problem by using the table below.

Symptom	Possible cause	Remedy
No indication and alarm in the front display panel even though the mains is normal.	The AC input power is not connected well.	Check if input cable firmly connected to the mains.
The icon ⚠ and 🔋 flash on LCD display and alarm beeps every second.	The external or internal battery is incorrectly connected.	Check if all batteries are connected well.
The icon ⚠ and **OVER** flash on LCD display and alarm beeps twice every second.	UPS is overload.	Remove excess loads from UPS output.
	UPS is overloaded. Devices connected to the UPS are fed directly by the electrical network via the Bypass.	Remove excess loads from UPS output.
	After repetitive overloads, the UPS is locked in the Bypass mode. Connected devices are fed directly by the mains.	Remove excess loads from UPS output first. Then shut down the UPS and restart it.
Fault code is shown as 43. The icon **OVER** lights on LCD display and alarm beeps continuously.	UPS is overload too long and becomes fault. Then UPS shut down automatically.	Remove excess loads from UPS output and restart it.
Fault code is shown as 14, the icon **SHORT** lights on LCD display, and alarm beeps continuously.	The UPS shut down automatically because short circuit occurs on the UPS output.	Check output wiring and if connected devices are in short circuit status.
Other fault codes are shown on LCD display and alarm beeps continuously.	A UPS internal fault has occurred.	Contact your dealer
Battery backup time is shorter than nominal value	Batteries are not fully charged	Charge the batteries for at least 7 hours and then check capacity. If the problem still persists, consult your dealer.
	Batteries defect	Contact your dealer to replace the battery.
The warning code 02 is shown, the icon ⚠ flashes on LCD display, and alarm beeps every second.	The input neutral wire is disconnected.	Check and correct the input neutral connection. If the connection is ok and the alarm is still displaying, please refer to the LCD setting section, to enter the neutral loss check menu, to see if the parameter3 is "CHE", if it is, please press the "Enter" key firstly to make the "CHE" flash and press the "Enter" key secondly to make the UPS clear the alarm. If the warning still exists, please check input fuses of L2 and L3.
	The L2 or L3 input fuse is broken.	Replace the fuse.

5. Storage and Maintenance

5-1. Storage

Before storing, charge the UPS at least 7 hours. Store the UPS covered and upright in a cool, dry location. During storage, recharge the battery in accordance with the following table:

Storage Temperature	Recharge Frequency	Charging Duration
-25°C - 40°C	Every 3 months	1-2 hours
40°C - 45°C	Every 2 months	1-2 hours

5-2. Maintenance

The UPS system operates with hazardous voltages. Repairs may be carried out only by qualified maintenance personnel.

Even after the unit is disconnected from the mains, components inside the UPS system are still connected to the battery packs which are potentially dangerous.

Before carrying out any kind of service and/or maintenance, disconnect the batteries and verify that no current is present and no hazardous voltage exists in the terminals of high capability capacitor such as BUS-capacitors.

Only persons are adequately familiar with batteries and with the required precautionary measures may replace batteries and supervise operations. Unauthorized persons must be kept well away from the batteries.

Verify that no voltage between the battery terminals and the ground is present before maintenance or repair. In this product, the battery circuit is not isolated from the input voltage. Hazardous voltages may occur between the battery terminals and the ground.

Batteries may cause electric shock and have a high short-circuit current. Please remove all wristwatches, rings and other metal personal objects before maintenance or repair, and only use tools with insulated grips and handles for maintaining or repairing.

When replace the batteries, install the same number and same type of batteries.

Do not attempt to dispose of batteries by burning them. This could cause battery explosion. The batteries must be rightly deposed according to local regulation.

Do not open or destroy batteries. Escaping electrolyte can cause injury to the skin and eyes. It may be toxic.

Please replace the fuse only with the same type and amperage in order to avoid fire hazards.

Do not disassemble the UPS system.

6. Specifications

MODEL		KO-100003P3 / KO-100003P3L	KO-150003P3 / KO-150003P3L	KO-200003P3 / KO-200003P3L
Input	Capacity	10000 VA / 8KW	15000 VA / 12KW	20000 VA / 16KW
	Phase	3-phase in / 3-phase out		
	Nominal Voltage	208/220/230/240 VAC (3Ph+N)		
	Voltage Range	176VAC ~ 300VAC		
	Frequency	46 Hz ~ 54 Hz or 56 Hz ~ 64 Hz		
	Power Factor	≧ 0.99 at 100% load		
Output	Voltage Range	208/220/230/240 VAC (3Ph+N)		
	Frequency	Line Mode: Same as Input ; Battery Mode: 50Hz or 60Hz ±0.1Hz		
	Wave Form	Pure Sinewave		
	Harmonic Distortion	≦ 2% THD (Linear Load) ; ≦ 5% THD (Non-Linear Load)		
	Overload Capacity (Line Mode)	100%~110%:10 mins; 110%~130%:1 min; >130%: 1 sec		
	Overload Capacity (Battery Mode)	100%~110%:30 sec; 110%~130%:10 sec; >130%: 1 sec		
Battery	Type	Maintenance Free Sealed Lead-Acid Battery		
	DC Voltage	240V		
	Capacity	12V / 9.0Ah x 20 pcs	12V / 9.0Ah x 40 pcs	
	Built-In Charger	1 A	2 A	2 A
	Charger (Optional)	Max. 4A		
	Recharger Time	9 hours recover to 90% capacity		
	Battery Handle	Fully recharge UPS after complete discharge or every three months when storaged		
Bypass	Automatic	Overload or UPS Failure		
	Transfer Time	0 ms (<4ms Line Mode to Bypass)		
Display	LCD	Load level, Battery level, AC mode, Battery mode, Bypass mode, and Fault conditions		
Audible Alarm	Battery Mode	Beep every 4 seconds		
	Battery Low	Beep every second		
	Overload	Beep twice every second		
	Fault	Beep continously		
Output	Sockets	Terminal Block		
Interface	Smart RS-232 & USB	Supports Windows® 2000/2003/XP/Vista/2008, Windows® 7, Linux, Unix, and MAC		
	SNMP Card (Optional)	Power management from SNMP manager and web browser		
Network	Surge Protection	Optional		
Environment	Temperature	0℃ ~ 40℃ ; 32℉ ~104℉		
	Humidity	0-95 % RH Non-condensing		
	Acoustic Noise	Less than 58dBA at 1mt	Less than 60dBA at 1mt	
Net Weight	W/O Battery (Kgs)	38	40	40
	With Battery (Kgs)	109	164	164
Dimensions	Standard (W x H x D) mm	250*826*815		
	Long (W x H x D) mm	250*826*592		

* Derate capacity to to 90% when the output voltage is adjusted to 208VAC.
**If the UPS is installed or used in a place where the altitude is above than 1000m, the output power must be derated one percent per 100m.
***Product specifications are subject to change without further notice.